DOCUMENT RESUME

ED 289 845 SP 029 720

AUTHOR Kwasneski, Kimberly A.
TITLE Class Size and Educational Effectiveness.
PUB DATE Nov 87
NOTE 39p.; Exit Project, Indiana University at South Bend.
PUB TYPE Reference Materials - Bibliographies (131) -- Information Analyses (070)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Academic Achievement; Classroom Environment; *Class Size; Elementary Secondary Education; Instructional Effectiveness; Small Classes; Student Attitudes; Student Behavior; Teacher Attitudes; *Teacher Student Ratio; Test Results

ABSTRACT

Brief abstracts of research studies on the subject of the relationship between class size and student achievement are presented in this bibliography. The first part of the study examines the research concerned with the reduction of class size and the positive effects it has on student achievement, particularly in the areas of reading and mathematics. The second part reviews the research that supports greater achievement gains with larger classes. The final area of concentration deals with the research studies showing no difference in student achievement with regard to class size. Particular attention is paid throughout the study to the statistical significance of test scores. Also, some research considering the effect class size has on student and teacher attitudes, student behavior, and classroom environment is included. (JD)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED289845

CLASS SIZE

AND

EDUCATIONAL EFFECTIVENESS

BY

KIMBERLY A. KWASNESKI

Graduate Student

Study Directed

by

Charles R. DuVall, Ph.D.

Submitted in partial fulfillment of the requirements
for the course E591 in the School of Education
Indiana University at South Bend
November, 1987

SP 029 720

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

K. Kwasneski

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

TABLE OF CONTENTS

	Page
INTRODUCTION	1
Statement of the Problem	2
Purpose of the Study	2
Organization of the Study	2
Definition of Terms	3
ANNOTATIONS	7
Studies Favoring Small Classes	7
Studies Favoring Large Classes	17
Studies Showing No Significant Difference in Class Sizes	21
TABLE OF CLASS SIZE STUDIES	26
SUMMARY	27
CONCLUSIONS	32
RECOMMENDATIONS	33
BIBLIOGRAPHY	34

INTRODUCTION

"I question the wisdom of a society that bans cyclamates, saccharin and red dye number two on the strength of one conclusive study out of ten, conducted on laboratory animals in a sterile environment, while at the same time ignoring (or calling insignificant) 50 percent of the research suggesting that class size does, indeed, affect pupil achievement, self-image and the quality of interaction between student and teacher. We are not talking about laboratory rats; we are talking about children - each with his or her own uniqueness, each ready to contribute to or detract from our society." (Bozzomo: 81)

The effect of class size on student achievement has concerned researchers and educators for quite some time. Most parents believe that smaller classes provide a better education for their children and most teachers, regardless of grade level and subject taught, when asked what they would change in order to become more effective most often said they "would decrease the number" of students in their classes. (Bain and Achilles: 665)

Thus, a considerable number and variety of research studies have been designed to determine the extent to which student achievement is affected by a reduction in class size. The findings of these studies vary; some favoring small classes, some favoring large and others resulting in no difference in achievement or classroom environment due to class size. These inconsistent findings can be attributed, in part, to lack of clear cut definitions for what constitutes a small or large class, various measures used to assess student achievement and failure to control important variables. Although these limitations exist, certain patterns do emerge from class size research and these are presented in the next sections of this paper. (Cotton and Savard: 3)

STATEMENT OF THE PROBLEM

Class size reduction needs to be implemented at the appropriate grade level to ensure greater student achievement and educational effectiveness.

PURPOSE OF THE STUDY

The purpose of the study was to examine the research on class size and student achievement in order to increase an awareness of the positive effects of class size reduction when implemented at the appropriate grade level.

ORGANIZATION OF THE STUDY

The first part of this study examines the research concerned with the reduction of class size and the positive effects it has on student achievement, in particular, in the areas of reading and math.

The second part of the study reviews the research that supports greater achievement gains with larger classes.

The final area of concentration deals with the research studies showing no difference in student achievement with regard to class size.

Particular attention is paid throughout the study to the statistical significance of test scores. Also, some research considers the effect class size has on student and teacher attitudes, student behavior and classroom environment and has been included within the annotation.

DEFINITION OF TERMS

Academic Achievement - "Knowledge attained or skills developed in school subjects usually designated by test scores" (Good: 7)

Accelerated Student - "Child whose achievement or mental growth is beyond that of the average child of the same chronological age" (Good: 94)

Achievement - "Accomplishment or proficiency of performance in a given skill or body of knowledge" (Good: 7)

Analysis of Covariance - "An extension of the methods of analysis of variance in which adjustments are made in the data for the criterion variable" (Good: 152)

Analysis of Variance - "An arithmetic procedure for treating the data for the criterion variable" (Good: 639)

Assessment - "The process by which one attempts to measure the quality and quantity of learning and teaching using various assessment techniques, e.g. assignments, projects, continuous assessment, objective-type tests, final examinations and standardized tests" (Page and Thomas: 26)

Attainment - "The stages of achievement reached by students, generally expressed in terms of grade levels" (Good: 47)

Chi-square Analysis - "A statistic used to test the agreement of obtained and theoretical distribution" (Good: 93)

Class Size - "The number of children enrolled in a class" (Good: 103)

Composite Score - "A summation of weighted scores or observations secured from two or more tests of the same or similar functions for a given individual" (Good: 519)

Control Group - (1) "The one of two or more groups that is not subjected to the experimental factor or condition introduced into the treatment of the experimental group"; (2) "The group with which the experimental group or groups are compared" (Good: 267)

Criterion Variable - "The measured value of a factor that is under experimental investigation" (Good: 638)

Dependent Variable - "A variable whose magnitude depends on the value of another variable(s)" (Good: 638)

Experimental Group - (1) "The one of two or more groups that is subjected to the experimental factor or condition"; (2) "Loosely, any of the groups in an experiment" (Good: 267)

Gain - "In an experiment the measured increment for an individual or a group in some factor as the result of a certain treatment" (Good: 256)

Gain Score - "Measured amount of change in an individual on some trait or variable due to treatment or instruction" (Good: 519)

Grade Equivalent - "A converted score expressed in terms of a scale in which the grade is a unit of measurement and indicating the grade level of the group for which the score is typical" (Good: 263)

Heterogeneous Grouping - "The classification of pupils for the purpose of forming certain groups having a high degree of dissimilarity" (Good: 269)

Indicators of Quality - "A measure designed to assess a school system's classroom processes on four criteria: individualization, interpersonal regard, group activity and creativity" (Olson: 63)

Instructional Processes - "The methods of instruction used to bring about desired change or learning" (Good: 307)

Longitudinal Study - "A study that follows a case or group of cases over a period of time" (Good: 565)

Mean - "A measure of central tendency which is obtained from the sum of the measures, observations, magnitudes, items or scores in a statistical series, divided by their number or frequency" (Good: 356)

Median - "A measure of central tendency; the point of the scale of frequency distribution at which 50 percent of the observations occur" (Good: 359)

Mental Ability - "A degree of ability represented by performance on a test selected for prediction of success in academic work" (Good: 2)

Meta-Analysis - "The application of statistical procedures to collections of empirical findings from individual studies for the purpose of integrating, synthesizing and making sense of them" (Wolf: 5)

Multivariate Study - "Any statistical procedure that is designed to describe, interpret and predict the behavior of two or more variables that change or interact simultaneously" (Good: 30)

Parametric Statistics - "Those statistical procedures used to assess data usually taken frrom samples of a population" (Dejnozka and Kapel: 381)

Percentile Ranking - "A derived score stated in terms of the percentage of examinees in a specified group who fall below a given score point" (Good: 468)

Performance - "Actual accomplishment as distinguished from potential ability" (Good: 414)

Production Units - "A block of work involving integrated skills which is to be completed under conditions approximating those found in the business office" (Good: 440)

Pupil - "One who attends a kindergarten or a school of elementary level" (Good: 461)

Pupil Achievement - "The status of a pupil with respect to attained skills or knowledge as compared with other pupils" (Good: 7)

Raw Score - "A score obtained on a test as determined by the performance itself, to which no correction or modification of any kind has been applied" (Good: 520)

Regression Analysis - "General term for statistical techniques which employ a correlation in order to predict probable relationships" (Page and Thomas: 288)

Residual - "The actual or observed value of a single measurement minus a computed value regarded as the most probable; the most probable value is often the arithmetic mean" (Good: 218)

Scale Score - "A measurement used to represent differences among individuals in performance, abilities, attitudes etc. which enables different test scores to be compared" (Dejnozka and Kapel: 454)

Significant Difference - "A difference which is so great that it may not be reasonably attributed to chance factors" (Good: 181)

Standard Deviation - "A widely used measure of variability, consisting of the square root of the mean of the squared deviations of scores from the mean of the distribution" (Good: 178)

Statistically Significant Difference - "A difference between two comparable statistics, computed from separate samples, that is of such magnitude that the probability that the difference may be imputed to chance is less than some defined limit" (Good: 181)

Student - "One who attends an educational institution of secondary or higher level" (Good: 561)

Student-Teacher Ratio - "An index of the number of pupils per teacher in a school or a school system; however, it does not accurately indicate the number of pupils that the average teacher has in a classroom" (Good: 470)

T-Distribution - "The sampling distribution of the ratio of a difference to its standard error" (Good: 191)

T-Score - "A standard score with a mean of 50 and a standard deviation of 10 which is a linear transformation of the raw score" (Good: 520)

Variable - "Any trait that changes from one case to another; more strictly, the representation of the trait in the form of measurement" (Good: 638)

STUDIES FAVORING SMALL CLASSES

Bain, Helen P. and C. M. Achilles, "Interesting Developments on Class Size," Phi Delta Kappan, 67.1 (May 1986): 662-65.

In August 1984, the Tennessee State University Center sponsored a three year study on the effects of a pupil/teacher ratio of 15:1 on pupils in grades 1-3. The program consisted of an experimental group of seven 1st grade classrooms (105 pupils), a control group (90 pupils) which served a population similar to the experimental group and a blind control group (105 pupils). Each pupil in the blind control group was matched with a pupil from the experimental group according to sex, race, birthdate (within 45 days of one another), total prereading raw score on the California Achievement Test (within four points) and economic status based on federally subsidized school lunches. The researchers compared the experimental group to that of the control groups and also to that of Nashville first graders as a whole. Although scheduled to be a three year study, first year performance on pre and post test scores in reading and math on the California Achievement Test significantly favored pupils in the experimental classes ($p<.01$). Other pupil outcomes examined included behavior, attendance and self concept. Teacher observations and attitudes were also recorded. Teachers agreed there were less disciplinary problems, fewer interruptions, more on task behavior and greater individualization.

Balow, Irving H., "A Longitudinal Evaluation of Reading Achievement in Small Classes," Elementary English, 46 (February 1969): 184-87.

The Riverside Unified School District, Riverside, California, initiated an experimental primary grade reading program based on the assumption that reading achievement was greater in small classes than in large classes. The program, which began in 1962, encompassed seven elementary schools with all children in grades one through three participating. Class size was reduced fifty percent for the experimental groups (15 pupils) while control groups remained at 30 pupils. The instrument used to determine achievement was the Metropolitan Achievement Test. Scores for each group were compared each year by an analysis of covariance. Pupils in the experimental groups for two or more years scored significantly higher than pupils in control groups. When 1st and 2nd grade test scores were analyzed the experimental groups scored significantly higher than the control groups. The same also held true when 2nd and 3rd grade scores were compared. However, no significant differences were found when 3rd and 4th grade tests were analyzed. The findings suggested that the influence of the program was cumulative and that first grade was the critical year of reading achievement.

Cannon, Gwendolyn, "Kindergarten Class Size - A Study," Childhood Education, 43 (November 1966): 9-11.

A 1955 study on the effect of class size on kindergarten groups was recorded to: 1) discover if children express more aggression in larger or smaller groups; 2) discern if children interact more successfully with their peers in larger or smaller groups; 3) show the number and quality of child-teacher contacts in large and small groups; 4) compare and evaluate the types of activities participated in by large and small groups; and 5) record and compare feelings expressed by the teacher in large and small classroom settings. The large group ranged from 34 to 39 children while the small group contained between 23 and 28 children. These two kindergarten classes had one teacher who attempted to follow the same program and procedures in the same room with the same equipment for both classes. Results recorded for the larger group included more aggressive behavior, a high level of frustration, a longer time between turns at an activity and longer wait for use of equipment and fewer opportunities for the teacher to guide children individually. The smaller group's recorded behavior reflected more security, patience and helpfulness. The teacher was able to direct, assist and listen more to children in this group therefore experiencing greater satisfaction, enjoyment and sense of achievement.

Carrington, Andrew T.; And Others, Class Size Project, 1980-1981. Final Report., Virginia Beach City Public Schools, Virginia, August 1981, 59 pp.

The Virginia Beach City Public Schools designed and conducted a study of the effect of class size on the learning of a specific population of Virginia Beach pupils. Their project was an effort to determine the effect of class size on the reading achievement of selected Virginia Beach elementary school first grade pupils. The study acknowledged certain limitations including its one school year duration, heterogeneous homeroom assignments and the use of only one norm referenced test to measure achievement gains. The research study consisted of large classes of twenty-nine pupils and small classes of twenty-one pupils, one class of each size from eight participating schools. Teachers and pupils were randomly assigned to classes. The analysis of covariance procedure was performed on the reading achievement test of the California Achievement Test. Results of the study showed that the reading achievement of the first grade pupils in the smaller classes was significantly higher than that of the pupils in the larger classes. Other comparisons of reading achievement were made between male, female, white and non-white pupils in smaller classes and their counterparts in larger classes. All comparisons were statistically significant ($p<.05$) with the exception of non-white pupils.

Filby, Nikola; And Others, What Happens in Smaller Classes? A Summary Report of a Field Study. Class Size and Instruction Project., National Institute of Education (DHEW), Washington, D. C., January 1980, 27 pp.

This case study was conducted in 1978 to investigate the changes in instructional processes and teacher and pupil behavior when class size is reduced. Two second grade classes in each of two schools participated in the study- one in rural Virginia and the other in inner-city California. Class size was reduced by one third at semester in each of the schools. Virginia classrooms were reduced from 20 to 13 pupils while California classrooms were reduced from 35 to 22 pupils. The new "classroom" made by reduction in class size was randomly formed. Information about classroom changes and pupil and teacher behavior was collected through observation, teacher journals, interview and teacher/researcher collaboration throughout the study. Researchers found that general patterns emerged when class size was reduced. Classrooms were managed smoothly and more effectively. Teachers spent less time disciplining pupils and pupils were less disruptive. Pupil attention to task during math and reading increased from 56% of the time in large classes to 72% in small classes. Also, pupils were absent less often in small classes, more individualization occured and teachers were able to increase the depth of lessons.

Frymier, Jack R., "The Effect of Class Size Upon Reading Achievement in First Grade," The Reading Teacher, 18 (October-May 1964-65): 90-93.

One central Florida school district conducted a study in 1961 to examine the effect of class size upon the reading achievement of first graders in twelve selected schools. Classrooms with more than 36 pupils and classrooms with less than 30 pupils were chosen for this study. Nine small classes containing 249 and six large classes with 238 pupils enrolled were identified. Since complete achievement data were available for 219 pupils in small classes and 201 in large classes those 420 pupils were used as the samples in the study. The Metropolitan Readiness Test was used as a predictor of success in reading and was routinely administered to pupils in September 1960. The test was also used to determine similarities and differences of large and small groups. From test results compiled the two groups were not compatible at the beginning of their first grade year. The large classes had a distinct advantage of being more "ready", a difference which was statistically significant at the .01 level of confidence. In May 1961 the Williams Primary Reading Achievement Test was given. The results indicated that the mean achievement of pupils in small classes was greater than the mean achievement of those in large classes. Also, the t-score computed to compare the difference between means was statistically significant at the .001 level.

Furno, Orlando F. and George J. Collins, Class Size and Pupil Learning, Baltimore City Public Schools, Maryland, October 1967, 153 pp.

The Baltimore City Public Schools conducted a five year study (1959-1964) to examine the relationship between class size and reading and arithmetic achievement. Participants in the study included 16,449 3rd graders assigned to "cells" according to 1) their parent's occupation; 2) intelligence test score of the pupil and 3) number of children enrolled in each class (class size). Small class size was considered 1-25 pupils while large class size had over 25 pupils. A summary of the class size findings for the five year period were as follows: 1) in reading achievement, pupils in smaller classes made significantly greater gains than pupils in larger classes. Of 118 comparisons, 92 favored small classes while 26 favored large classes, a 3.5 to 1 ratio; 2) in arithmetic achievement, pupils in smaller classes again made greater gains. Of 125 comparisons, 96 favored small classes while 29 favored large classes, a 3.3 to 1 ratio.

Glass, Gene V. and Mary Lee Smith, Meta Analysis of Research on the Relationship of Class Size and Achievement. Class Size and Instruction Project., Far West Laboratory for Educational Research and Development, September, 1978.

The Far West Laboratory for Educational Research and Development sponsored a project on class size and instruction. The 1978 study, conducted by Glass and Smith, dealt with the relationship of class size and student achievement. They took various types of scores and converted them to percentile rankings and grade equivalents so that the data from different studies could be compared. The data base contained nearly 900,000 students and spanned a 50 year period. Results of the 77 studies that were analyzed produced 725 comparisons of small and large classes. Over half (56%) of the comparisons made dealt with children whose ages ranged from 5 to 11. Data for elementary and secondary students were analyzed separately and sixty percent of these comparisons favored small classes. The small class size comparison was slightly stronger for secondary students and no difference existed when different subjects were analyzed. Other findings from the meta analysis of the studies showed that: 1) as class size decreased, student achievement increased; 2) instruction groups of fifteen students or less scored several percentile ranks above instructional groups containing twenty-five or thirty students and 3) dramatic increases in achievement occur only when class size drops below twenty.

Meredith, Vana H.; And Others, South Carolina First Grade Pilot Project 1975-76: The Effects of Class Size on Reading and Mathematics Achievement, South Carolina State Department of Education, Columbia, January 1977, 96 pp.

The South Carolina First Grade Pilot Project 1975-76 was conducted to examine the effects of class size on reading and mathematics achievement of first graders. The effect of teacher inservice training on pupil achievement was also examined. The fifty project classes chosen consisted of 25 pairs of classes that were matched racially, socioeconomically and by school curriculum. Each pair included one experimental class (small class) containing an average 19.9 pupils and one control class (large class) containing an average of 26.7 pupils. For each pair of classes either both teachers received inservice training or neither received inservice training. The California Test of Basic Skills, given in September 1975, was used as a pretest to assess prior achievement. Prior achievement was defined as the total scale scores received on the Reading and Math portions of the CTBS. The post test was administered in May 1976 to assess end of the year achievement. An analysis of covariance was performed using pretest scores as the covariate and post test scores as the dependent variable. The results indicated a statistically significant difference ($p<.0003$) of mean post test reading scale scores for the small class size group over that of the large class size group. In mathematics, small classes scored higher than large classes but the difference was not significant. Another significant difference ($p<.05$) was found between the overall achievement of first graders in small classes over the overall achievement of first graders in large classes.

Moody, William B.; And Others, The Effect of Class Size on the Learning of Mathematics: A Parametric Study., Paper presented at the meeting of the American Educational Research Association, April 1972, 13 pp.

This 1973 study was conducted to determine the relationship between class size and mathematics achievement of 4th grade pupils. Three schools in a northern Delaware school district each randomly contributed 83 4th graders for a total of 249 pupils. Within those three schools, the 83 pupils were again randomly assigned to one of the four following class size groups: Group 1:1 (20 pupils) - each student was instructed individually by one teacher; Group 1:2 (20 pupils) - two pupils were instructed simultaneously by one teacher; Group 1:5 (20 pupils) - five pupils were simultaneously instructed by one teacher and Group 1:23 (23 pupils) - all 23 pupils were instructed simultaneously by one teacher. Junior and senior elementary education majors volunteered to be the teachers in the study. Ten mathematical objectives were presented to each group in a 30 minute time period. All 4th grade pupils were given the same pretest one day before instruction and post tests were administered immediately after instruction. Both tests contained two problems for each mathematical objective for a total of 20 items. Pupils in each of the three smaller size groups scored significantly higher than the pupils in the large groups of 23 pupils. Pupils in Groups 1:1 showed superior attainment of the ten objectives over that of the pupils in groups 1:5. Although no significant difference was found between Groups 1:2 and Groups 1:5, both groups were significantly superior to Groups 1:23.

Olson, Martin, "Ways to Achieve Quality in School Classrooms: Some Definitive Answers," Phi Delta Kappan, 53 (September 1971): 63-65.

This 1970 investigation was undertaken to answer major questions regarding classroom variables and their relationships with one another. Class size was among those variables examined. The research data were obtained from 112 school districts across the United States which had had "Indicators of Quality" applied to assess the quality of classroom processes. A total of 18,528 classroom observations were conducted and analyzed, 9,961 from elementary and 8,567 from secondary classrooms. A multivariate frequency distribution and chi-square analysis were used to compare mean scores and standard deviations and a stepwise regression process was used to determine the importance and significance of classroom variables. Seven classroom variables were found to be predictors of school quality, while four variables were found to be insignificant as predictors of quality. In order of importance the seven predictors of school quality found in this study were: style of educational activity, subject taught, class size, grade level, type of teacher, number of adults and day of the week. Those predictors were found to be equally important at both the elementary and secondary levels. The relationship between class size and achievement was consistent throughout the study - smaller classes scored significantly higher than larger ones.

Philadelphia Federal Reserve Bank Study, "Schools Do Make a Difference," Today's Education, 64 (November-December 1975): 24-31.

Summers and Wolfe conducted this study for the Department of Research of the Federal Reserve Bank of Philadelphia in 1975 to determine which school resources promote learning and how those resources could best benefit the learning of various types of students. This two year investigation studied a data base of 1,896 students from 150 elementary, junior and senior high Philadelphia schools. To measure student achievement the prescribed standardized test in basic skills was administered. The growth in student achievement was then examined in relation to specific school resources. Greater student achievement was found when schools were smaller, heterogeneous and racially balanced. Smaller class size also had an impact on student achievement. While classrooms of 27 or fewer benefited students at all levels, especially low ability elementary students, classrooms of 34 or more appeared to hinder growth of all students. Student achievement was also greater when high achievers were instructed by more experienced teachers and low achievers were instructed by new, inexperienced teachers. According to Summers and Wolfe, if resources were matched with specific students (i.e. high ability students with more experienced teachers, low ability students in smaller classrooms) schools would be more effective and productive.

Project Primetime: 1982-83 Report., Indiana State Department of Public Instruction, Indianapolis Division of Curriculum, November 1983, 14 pp.

Prime Time began in 1981 as a two year experimental program to improve basic skills in areas of reading, writing and math by reducing class size in the primary grades. Pupil-teacher ratio was reduced to 18:1. This report summarized the results of Project Prime Time during the 1982-83 school year. Project Prime Time was set up to test the theory that smaller classrooms were more conducive to learning. The instrument used for the basis of comparison was the standardized test already established in each school district participating. After two semesters, 61 percent of the Prime Time students exceeded normal achievement in reading and 53 percent exceeded it in math. The percents for those pupils not in the program were 47 and 49 respectively. The report also included tables that compared Prime Time students and "other" students by grade level and a summary of teacher comments about involvement with Prime Time. The results of the various tests were obtained from nine Indiana schools that participated in Project Prime Time during the first two school years of the program.

Smith, Mary Lee and Gene V. Glass, Relationship of Class Size to Classroom Processes, Teacher Satisfaction and Pupil Affect: A Meta-Analysis. Class Size and Instruction Project., Far West Laboratory for Educational Research and Development, July 1979.

In conjunction with the research done at the Far West Laboratory for Educational Research and Development on class size and achievement, a second report by Smith and Glass attempted to examine the relationship between class size and classroom processes. Issues investigated in the study with respect to small class size included teachers' attitudes, planning, feedback, expectations, evaluation and discipline. Their research also studied the effect of class size on pupil traits such as behavior, attitude, motivation, self-concept, anxiety and attendance. Quality of the learning environment and interaction between pupils and between pupils and teachers were also examined in the study. The findings indicated that higher quality classroom environment, better pupil attitudes and greater teacher satisfaction were some of the positive effects of small class size.

Stallings, Jane; And Others, Early Childhood Education Classroom Evaluation, California State Department of Education, Sacramento, California, January 1978, 114 pp.

An evaluation of several California experimental programs in 1975-76 led to the finding that third grade pupils who scored at or below the twentieth percentile on the Entry Level Test in 1973-74 had a marked decline in reading test scores relative to their predicted scores over the three year period 1973-74 to 1975-76. Some individual schools, however, had patterns of scores that increased over this period. This study was conducted to examine the circumstances associated with the decline or increase of third grade test scores in reading and to identify those classroom processes related to a higher rate of achievement. A total of 45 third grade classrooms were selected from seven schools with test scores that increased and seven schools with test scores that decreased. The relationships between classroom processes, reading achievement and absence rate were studied using correlation and regression statistics and reading test scores from the California State Assessment Test were also analyzed. Results include the following: 1) Classrooms with a lower ratio of students to adults had significantly greater gains in reading achievement; 2) Absence rate was lower in classrooms with a lower student-adult ratio; 3) Highly structured classroom environment and instruction was identified with a greater gain in reading test scores and 4) Small group instruction was more effective and efficient than working with one student at a time.

Wilsberg, Mary and Lawrence Castiglione, The Reduction of Pupil-Teacher Ratios in Grades 1 and 2 and the Provision of Additional Materials: A Program to Strengthen Early Childhood Education in Poverty Area Schools., New York City Board of Education, Brooklyn, New York, November 1968, 244 pp.

This project was part of the Program to Strengthen Early Childhood Education in Poverty Area Schools in New York City. It was funded under the Title I Act and took place during the 1967-68 school year. The pupil-teacher ratio in grades 1 and 2 were reduced to 15:1 and 20:1 respectively, but statistical data were only available for 1st grade. An allocation of eight dollars per child was used for purchasing extra supplies, a dollar of which went toward the purchase of paperback books for the pupils' personal libraries. The population for the study included 1,127 project school pupils and 516 comparison school pupils. All 1st grade students in the study were given the New York State Readiness Test in October 1967 and the Gates-MacGinitie Reading Achievement Test in June 1968. Results from the beginning of the year test indicated a significant difference ($p<.01$) for the comparison group over the project group in school readiness. End of the year findings from an analysis of variance showed a statistically significant difference ($p<.05$) favoring the project group. Although the raw scores of the comparison group were still higher than the project group, amount of improvement was significantly greater for the project group. Therefore the program was deemed successful.

STUDIES FAVORING LARGE CLASSES

Eastburn, Lacey, "Report of Class Size Investigations in the Phoenix Union High School, 1933-34 to 1935-36," Journal of Educational Research, 31.2 (October 1937): 107-117.

The Phoenix Union High School conducted an experiment during the 1934-35 school year to determine the relationship between class size and achievement on three ability levels in English. Three hundred sixty-six eleventh grade students comprised the population for the study. Three teachers each taught one large class (48-50 students) and three small classes (23-25 students). Curriculum, texts, tests and methods of instruction were kept as close as possible. Two teacher made examinations and three standardized tests were administered to all students, Form A at the beginning of the school year and Form B at the end of the school year. The difference in initial and final scores on Forms A and B were used to measure achievement. Initial scores showed no significant difference for any of the groups. Final scores revealed the following results: 1) In the upper ability level large classes scored higher than small classes on three of the five tests, a slight advantage for the large classes but not statistically significant; 2) In the middle ability level students in large classes scored higher than small classes on four of the five tests, a difference considered statistically significant and 3) Lower ability level students in large classes also scored higher than small classes on four of the five tests, again a statistically significant difference.

Flinker, Irving, "Optimum Class Size: What is the Magic Number?" Clearinghouse, 46 (April 1972): 471-73.

George Gershwin Junior High School 166 in Brooklyn, New York was the site of this 1970 study set up to compare measurable growth in mathematical and language arts skills and to obtain information about the teaching of large and small classes. Growth in attitudes, appreciations, habits and social relationships was not measured. One hundred twenty-three seventh grade students, one large class of 55 students and two small classes of 34 students, comprised the population for the study. The students were arranged in order of ability as measured by the Metropolitan Achievement Test in Reading in October 1970. The first, fourth, seventh, etc. ranked students were placed in the large class, second, fifth, eighth, etc. in one small class and third, sixth, ninth, etc. in the other small class. In each subject area the department chairman taught the larger class, while the two smaller classes in each area were taught by less experienced teachers. All teachers met periodically to keep content, instructional materials, lessons and time as equal as possible. To assess achievement, the Metropolitan Achievement Test was administered in reading and math and the New York State Junior High School Survey Tests in English were given in language arts. According to test results there was no significant difference between the reading ability of the large group and the two small groups. In math the large group's mean improvement was statistically significant, while the small groups showed slight mean improvement not statistically significant.

Madden, J. Vincent, "An Experimental Study of Student Achievement in General Mathematics in Relation to Class Size," School Science and Mathematics, 68 (October 1968): 619-22.

This study was designed to measure the effect of class size on the achievement of ninth grade general mathematics students. Seven high schools in the Phoenix Union High School System, Phoenix, Arizona, participated in the study and students were randomly selected from nineteen general mathematics classes. The experimental groups were identified as having between seventy to eighty-five students and the control groups contained twenty-five to forty students. Students were also selected according to their mathematical ability - low and high achievers were excluded from this study. Students whose mathematical ability fell between the thirtieth and seventieth percentiles on the Contemporary Mathematics Test, Junior High School Level were chosen as the population for this study. Three ability levels of that population were identified. The experimental study lasted one semester. The analysis of variance performed on the post-test scores of the Contemporary Math Test revealed a significant difference, at the .05 level, in the achievement of students in the experimental (large) groups over that of the control (small) groups. Also significant at the .05 level was the achievement of students in the average ability level in the experimental group over the average ability level students in the control group.

Menniti, Daniel J., "A Study of the Relationship Between Class Size and Pupil Achievement in the Catholic Elementary School," Dissertation Abstracts International, 1964, 25, 2854-55, Order No. 64-10,751.

Menniti conducted an investigation of class size research from 1896-1963 which revealed no Catholic school studies. So this 1964 study was initiated to examine the relationship between class size and pupil achievement in the Catholic schools. Eighth grade pupils in the school systems of the Dioceses of Harrisburg, Pennsylvania and Evansville, Indiana participated in the study. Classrooms from each diocese were paired for comparison and grouped into low, average and high ability levels. Small classes contained no more than 35 pupils and large classes contained no fewer than 40. Supervisory reports were used to eliminate classrooms that were overcrowded and physically inferior. To equalize the teacher variable the supervisory reports were also used to eliminate teachers of superior and inferior ability. Raw scores on achievement tests and I.Q. scores were gathered and used as a basis for comparison. A statistical analysis of the results revealed a significant difference in the reading achievement for the average ability pupils of the large classes in the Harrisburg Diocese. A significant difference was also found for the average ability pupils of the large classes in mathematics achievement in both dioceses.

Warburton, John T., "An Experiment in Large Group Instruction," Journal of Secondary Education, 36 (November 1961): 430-32.

During the 1959-60 school year the Department of Instruction was authorized by the Grossmont Union High School District Board of Education, Grossmont, California to conduct an investigation regarding large group instruction. The purpose of the experiment was to determine whether a group of 100 or more students in a class could achieve as effectively as a group of 30 to 35 students. Two 12th grade English classes in two different high schools were established, one with 125 students and the other with 35 students. Identical composition and grammar texts were used and curriculum was kept basically the same. Students were required to write one composition per week. There were some differences in the selection of literature which students read, but all selections were English literature of the 19th and 20th centuries. At the beginning and end of the academic year the Gulick Vocabulary and SCAT-STEP test batteries were administered to the students in both classes. The Reading, Writing and Listening sections of the STEP tests were used to evaluate student achievement. The STEP test assessed the student's ability to solve new problems with information learned as well as course content. The difference in means between the two groups after the fall testing was significant beyond the .001 level in favor of the small group. The results of the spring testing showed that the large group gained over the small group in all areas, significantly in the areas of reading and writing.

STUDIES SHOWING NO SIGNIFICANT DIFFERENCE IN CLASS SIZES

Anderson, Frank H.; And Others, "A Report of an Experiment at Camelback High School," Mathematics Teacher, 56 (March 1963): 155-59.

A class size experiment at Camelback High School in Phoenix, Arizona during the 1960-61 school year was conducted because of special circumstances. The number of students enrolled for the accelerated ninth grade algebra class doubled in size from 60 students in 1959 to 120 students in 1960. Also, the instructor agreed to teach one large class of 80 and one small class of 40 in order to prove his assumption that high caliber students could learn just as well in large groups as in small. In this way no student would have to be eliminated from the program. To be eligible for the class students had to score in the eighth or ninth stanine on the Differential Aptitude Numerical Test, be recommended by a teacher, show sufficient interest in the subject and have parental permission. Students were assigned to the large or small group at random and a comparison of the groups indicated a slight advantage in favor of the small class. At the beginning and end of one semester the Sequential Test of Educational Progress, Mathematics Test, was administered to all the students as a basis of comparison between the two groups. The middle 50 percent of each group, means, medians and differences of means between groups were calculated and analyzed and no significant statistical differences were found. The instructor felt the large group required more than twice the time needed for planning, grading and recording (even with the help of two 12th grade student aides), and did not recommend this approach for regular math classes.

DeAngelis, Joseph, Jr., The Influence of Class Size on Student Performance in a Secondary School Science Laboratory, Masters Degree Research Project at Beaver College, Glenside, Pennsylvania, 1977, 15 pp.

In 1975, two classes of ninth grade students were formed to test the hypothesis that class size influences student performance in a secondary school science laboratory. Composite scores of the Scholastic Testing Service achievement tests were used to form the two classes. Students within the 45-55 percentile range were randomly assigned to either the large class of 46 students or the small class of 23 students. In both classes the students worked in pairs with their own set of equipment and were given individual attention when needed. Both classes were taught by the same instructor to eliminate teacher and presentation differences. The Introductory Physical Science program curriculum, a laboratory oriented program, was taught to both groups for a period of six months. Performance was determined by the prescribed standardized achievement test. The finding of this study was that the achievement of students in a science class of 23 was not significantly different than that of a science class of 46 students.

Good, Glen A., "Effect of Class Size on Skills Acquired in Typing," Dissertation Abstracts International, 1970, 31, 2790-A, Order No. 70-24,160.

This investigation was conducted to determine whether class size affected student achievement in first year typing. The study took place at Shikellamy High School in Sunbury, Pennsylvania during the 1968-69 school year. From the 205 students enrolled for Typing I, a control group of 26 students and an experimental group of 61 students were randomly selected. Both groups were composed of students from the tenth through twelfth grades and contained college preparatory, academic, business and general education students. One teacher instructed both groups during the 2nd and 3rd periods of the day for 47 minutes. The experiment, 36 weeks in length, began in September and continued until June. The Typewriting Achievement Test, First Year, Form B, was used to determine achievement outcomes and was administered to both groups at the end of the school year. Achievement in basic information, straight-copy typing and production units was measured. Results according to a "t" distribution revealed that differences were not statistically significant at the .05 level. Since the students in the large group achieved as well as the students in the small group, it was determined that the small Typing I classes would be discontinued.

Johnson, Mauritz and Eldon Scriven, "Class Size and Achievement Gains in Seventh- and Eighth-Grade English and Mathematics," School Review, 75 (Autumn 1967): 300-310.

Johnson and Scriven conducted a study on class size and achievement using data obtained by the Quality Measurement Project and made available by the New York State Education Department. Scores of seventh and eighth grade students tested with the Iowa Test of Basic Skills in successive school years 1957-58 and 1958-59 were selected for the study. A total of 103 7th grade and 162 8th grade classes were identified, 130 English classes and 135 Mathematics classes. Small classes contained no more than 24 students and large classes no less than 34 students. Achievement was determined by gain scores (the difference between the grade equivalent achieved in seventh and eighth grades) on the reading comprehension and arithmetic tests of the Iowa Test of Basic Skills. Findings of the study revealed that gain differences between large and small classes were generally very small and inconsistent. Seventh grade gains were greatest for small classes in both English and Math, but the differences were not statistically significant. Eighth grade gains were greatest for large classes in both subject areas.

Shapson, Stan M., "An Experimental Study of the Effects of Class Size," American Educational Research Journal, 17.2 (Summer 1980): 141-52.

The Toronto Board of Education sponsored this study which examined the effects of class size on teacher expectations and attitudes. The two-year experiment consisted of sixty-two fourth grade classes with class sizes of 16, 23, 30 and 37 pupils. Teachers and pupils were randomly assigned, but neither spent both years in the same size classroom. Instruments used to measure the effects of class size included questionnaires, opinion and attitude surveys and formal observation. Standardized tests were used to measure achievement in areas of reading comprehension, vocabulary, mathematics problem-solving, mathematics concepts, art and composition. Results of the study showed relatively small differences between class sizes, however smaller classes had increased mathematics concepts scores, increased verbal participation, increased scores on "Indicators of Quality", more frequent reading instruction and less noise. Before the survey began teachers believed that smaller classes promoted more individual attention to pupils and greater individualized instruction along with a more enjoyable atmosphere. They also believed this would increase pupil achievement. Eighty-one percent of the teachers reported their expectations confirmed by the study, but the data collected did not support their feelings. Although class size made little difference to pupils at this age level, it made a tremendous difference to teachers.

Spitzer, Herbert, "Class Size and Pupil Achievement in Elementary Schools," Elementary School Journal, 55 (October 1954): 82-86.

This 1953 investigation was designed to test the hypothesis that superior achievement results when class size is small in elementary schools. Iowa cities with a population of five thousand and over that administered the Iowa Every-Pupil Tests of Basic Skills were chosen for this study. Reading comprehension, language skills, study skills and arithmetic skills were the areas included in the test. Ninety-four third grade classes and eighty-five sixth grade classes contributed the data for this study. Large classes consisted of 30 or more pupils and small classes contained 26 or fewer pupils. To determine the relationship between class size and achievement, the average scores made in each class on each of the four areas of the test were used. In the third grade the small classes had slightly higher mean scores on three of the four areas, but the difference was not large enough to be statistically significant. At the sixth grade level, the small classes again scored slightly higher in three of the four areas. Only one difference was statistically significant at the .02 level.

The Influence of Class Size on Academic Attainment and Student Satisfaction, Edward W. Clark High School, Las Vegas, Nevada, 80 pp.

During the 1966-67 school year Edward W. Clark High School, Las Vegas, Nevada, conducted an investigation to determine if a relationship existed between class size and student achievement in the subject areas of Business Law, Introduction to Business and U. S. Government. Two hundred twenty-four students, randomly assigned to a large (experimental) or small (control) class for each subject, comprised the population for this nineteen week study. Experimental classes contained between 45-52 students and control classes ranged from 24-27 students. Ninth through twelfth grade students were enrolled in Business Law and Introduction to Business while only eleventh and twelfth grade students composed the U. S. Government Classes. Experimental and control groups each met for the same amount of time and used the same text books in respective subject areas. The California Short-Form Test of Mental Maturity was administered during the first and last week of the study to establish mean intellectual scores for each group. A t-test applied to the results revealed no significant differences in mean intellectual scores on the pretest between the experimental and control groups in all subject areas. The posttest means between the two groups did not reach a significant level in Business Law or Introduction to Business. In U. S. Government, however, the control group scored significantly higher than the experimental group, a difference statistically significant at the .05 level of confidence.

Woodson, Marshall S., "Effect of Class Size as Measured by an Achievement Test Criterion," IAR Research Bulletin 8.2 (February 1968): 1-6.

This study was undertaken to examine several questions related to class size and pupil achievement. The main areas investigated whether the class size-academic achievement relationship existed for: 1) pupils within a school district; 2) pupils of different potential; 3) different subject areas; 4) various class sizes; 5) school districts of different sizes and 6) different grade levels. A statistical comparison among 95 school districts was organized. The participating school systems administered one of the following test batteries: the California Achievement Test, the Iowa Test of Basic Skills, the Metropolitan Achievement Test or the Stanford Achievement Test. Test results from the math and reading subtests and composite scores from the total test batteries were obtained and converted to standard scores. Also, results of the Otis Intelligence Test Scale were used to compute residuals. These residuals were used as the criterion against which the class size data were examined. Only fourth and sixth grade regular pupils taught in self-contained academic classrooms were included in this study. They were further classified into high, middle and low groups according to the Otis scale. The statistical analysis reported a small and inconsistent inverse relationship between class size and academic achievement in all areas questioned. This relationship was reported to be smaller for: 1) higher ability students than lower ability students; 2) the total achievement battery and math subtests than reading subtests and 3) sixth grade students than fourth graders.

CLASS SIZE STUDIES

(By Author, Grade Level and Subject)

SMALL SIGNIFICANT	LARGE SIGNIFICANT	LARGE/SMALL INSIGNIFICANT
1. Bain - 1st (Reading & Math)	1. Eastburn - 11th (English)	1. Anderson - 9th (Math)
2. Balow - 1st-3rd (Reading)	2. Flinker - 7th (Math)	2. DeAngelis - 9th (Science)
3. Carrington - 1st (Reading)	3. Madden - 9th (Math)	3. Good - 10th-12th (Typing)
4. Frymier - 1st (Reading)	4. Menniti - 8th (Math & Reading)	4. Johnson - 7th-8th (Math & English)
5. Furno - 3rd (Reading & Math)	5. Warburton - 12th (English)	5. Shapson - 4th (Reading & Math)
6. Glass - K-12th (All subjects)		6. Spitzer - 4th, 6th (Reading & Math)
7. Meredith - 1st (Reading)		7. --Clark - 9th-12th (Business)
8. Moody - 4th (Math)		8. Woodson - 4th, 6th (Reading & Math)
9. Olson - K-12th (All subjects)		
10. Philadelphia - K-12 (All subjects)		
11. Project Primetime-1st (Reading & Math)		
12. Stallings - 3rd (Reading)		
13. Wilsberg - 1st (Reading)		

SUMMARY

The main purpose of the early elementary school is the development of basic skills. Although many factors affect a child's ability to learn, studies have revealed that, particularly in the primary grades (K-3), pupils need the extra attention provided by reductions in class size. Balow's study found that greater achievement occurred in small classes (15 pupils) during the first two years of reading instruction than in the later grades. (pp. 185-186) According to the study directed by Stallings, a strong correlation existed between a lower pupil-teacher ratio and reading achievement in 3rd grade. The reduction in class size allowed for intensive small group instruction leading to significant gains in reading achievement. (p. 6)

Other studies also indicated positive effects of a reduction in class size on reading achievement in the primary grades. Statistically significant differences in 1st grade reading achievement in favor of small classes were found in separate studies by Carrington and Frymier. Achievement gains in reading for pupils in Carrington's study were statistically significant at the .05 level. (p. 49) Frymier's pupils in small classes overcame a distinct disadvantage of being less "ready" at the beginning of their 1st grade year and surpassed the reading achievement of pupils in large classes at the end of the year, statistically at the .001 level of confidence. (p. 92)

Similar results have been obtained by studies investigating the relationship between pupil achievement in reading and math and a

reduction in class size. According to the meta analysis conducted by Glass and Smith, as class size decreased, achievement increased. They claimed that the difference in being taught in a class of 20 versus a class of 40 was an advantage of six percentile ranks (p. 9) and the difference in achievement between a class of 10 versus a class of 20 was larger than ten percentile ranks. (p. 60-61) A five year study by Furno and Collins also showed greater gains on standardized achievement tests for pupils in smaller classes in 3rd grade. Comparisons made favored pupils in small classes (25 pupils or less) over large classes (over 25 pupils) by over a 3 to 1 ratio in both reading and math. (p. 142) Bain and Achilles reported a statistically significant difference ($p<.01$) in reading and math achievement in classrooms with a pupil-teacher ratio of 15:1. (p. 665)

Classroom environment, teacher attitude and student behavior were also affected by a reduction in class size. A study on kindergarten groups by Cannon indicated a high level of frustration and more aggressive behavior for pupils in the large group (34-39 pupils), while behavior in the small group (23-28 pupils) was more secure, patient and helpful. Atmosphere in the small classroom was more relaxed and the teacher enjoyed a greater sense of satisfaction and achievement because of the quantity and quality of interactions with the pupils. (p. 10) First grade teachers in the Project Primetime study experienced some of the same feelings. They included increased attention to pupils, more individualization, curriculum depth and decreased discipline problems as the major advantages of the program. (pp. 10-11)

A second report by Smith and Glass attempted to examine the relationship between class size and classroom processes. The positive effects of small class size found in the study included higher quality classroom environment, better pupil-teacher interaction and greater teacher satisfaction. (p. 81) Research by Filby noted predictable differences in classroom processes that followed simply from the numbers: lines were shorter, pupils were more visible and greater attention was paid to each pupil. Classroom management was more effective in small classes, pupil attention was higher, attitudes among teachers and pupils improved and disruptive behavior was much less frequent. (pp. 15-16)

Several studies also suggested matching class size with the specific and unique needs of the student. Olson's study used "Indicators of Quality" to assess a classroom's processes on individualization, interpersonal regard, group activity and creativity. He found seven variables to be predictors of quality and in proper combination believed they would produce the greatest possible classroom performance. (p. 65) According to Summers and Wolfe, schools would be more effective and productive if school resources were matched with specific students, i.e. low-ability elementary pupils in smaller classrooms. (p. 27)

As children mature and become more independent, they are able to assimilate material in a larger group setting. The need for smaller classes is less critical. Flinker's study showed statistically significant mean improvement in math for 7th grade students in a large

group of 55 over that of two small groups of 34. (p. 475) Math achievement was also examined in Madden's investigation. A significant difference, at the .05 level, was found for ninth grade students in large classes (70-85 students) over that of the small classes (25-40 students). (p. 620) Menniti researched the math and reading achievement of 8th grade students in two Catholic school systems. Significant differences in math were found for large classes (more than 40 pupils) over small classes (less than 35 pupils) in both dioceses and in reading in one diocese. (p. 2855)

Two investigations in English also favor large class achievement. Eastburn's study found significantly higher test scores for 11th grade students in large groups (48-50 students) over small groups (23-25 students). (p. 110) Twelfth graders in large classes (125 students) in Warburton's experiment gained in all areas over the small classes (35 students), significantly in the areas of reading and writing. (p. 432)

In other junior and senior high school studies there appeared to be no clear effect of class size on student achievement. Anderson's study of accelerated ninth grade algebra students showed no significant difference between the large (80 students) and small (40 students) groups. (p. 158-159) Research conducted by DeAngelis on ninth grade students in a secondary school science laboratory revealed no significant difference in achievement between a small group of 23 students and a large group of 46 students. (p. 10) And Good's investigation of student achievement in first year typing also indicated no difference between large (61

students) and small (26 students) classes. (p. 2790)

Inconclusive results were reached at Edward W. Clark High School in Las Vegas for small (24-27 students) and large (45-52 students) classes in Introduction to Business and Business Law. (p. 34-35) Similar findings were reported in the study conducted by Johnson and Scriven in English and Math. Differences in gain scores for small groups (no more than 24 students) and large groups (no less than 34 students) were reported to be very small and inconsistent. (p. 304)

Of the studies reporting no significant differences between large and small classes, three were conducted at the elementary level (4th and 6th grades) in reading and math. Differences were not significant, but in all cases achievement was greater in small classes. Shapson believed increased teacher morale due to smaller class size found in his study to be just as important a consideration in instructional planning as student achievement. (p. 151)

Reduction of class size in the early elementary years would allow for maximum pupil achievement and effective instructional practices. Logic would suggest that primary grade pupils in small classrooms would receive the attention necessary for the acquisition of basic skills in reading and math. "And might larger expenditures in the early grades pay off later in fewer dropouts, fewer retentions and a better prepared workforce?" (Bain and Achilles: 665)

CONCLUSIONS

It was concluded from studies in the primary grades that a strong relationship existed between class size and pupil achievement. Reductions in class size at this level allowed for increased attention to pupils when developing basic skills in reading and math. Suggested class sizes varied, but most studies favored classrooms of between 15 and 25 pupils for maximum educational effectiveness.

It was also determined from the research that classroom environment, teacher morale and student behavior were positively affected by the smaller classroom setting. Classroom atmosphere was more relaxed and less crowded. Teachers were able to manage activities more effectively and increase the depth of lessons, thus experiencing a greater sense of achievement and satisfaction. Quantity and quality of pupil-teacher interactions improved and students were less disruptive and aggressive.

From the research in the junior and senior high schools it was concluded that no necessity existed for class size reductions. Students at these levels were able to achieve in large classes as well as or better than in small classes.

The importance of the development of basic skills in the primary grades cannot be overemphasized or overlooked. Neither can helping a child build a positive self-concept and attitude toward school. The early grades are crucial to learning and class size reduction at these levels can positively affect pupil growth and achievement. "If schools are to be made better, start at the beginning." (Sava: 64)

RECOMMENDATIONS

It is recommended that:

1. School systems reduce class size at the early elementary grade level to a maximum of 20 pupils for greatest possible pupil achievement and educational effectiveness. Primary grade pupils (K-3) can best be benefited by reductions when developing basic skills in reading and math.

2. School systems not reduce class size at the higher grade levels. Achievement gains of junior and senior high school students are relatively small and inconsistent in relation to class size.

3. School systems refrain from increasing class size in the interest of teacher morale and classroom management.

4. Additional class size research be initiated that attempts to control important classroom variables, i.e. teacher and instructional methods.

BIBLIOGRAPHY

Anderson, Frank H.; And Others, "A Report of an Experiment at Camelback High School," Mathematics Teacher, 56 (March 1963): 155-59. (21, 26, 30)

Bain, Helen P. and C. M. Achilles, "Interesting Developments on Class Size," Phi Delta Kappan, 67.1 (May 1986): 662-65. (1, 7, 26, 28, 31)

Balow, Irving H., "A Longitudinal Evaluation of Reading Achievement in Small Classes," Elementary English, 46 (February 1969): 184-87. (7, 26, 27)

Bozzomo, Lawrence E., "Does Class Size Matter?" National Elementary Principal, 57.2 (January 1978): 78-81. (1)

Cannon, Gwendolyn, "Kindergarten Class Size - A Study," Childhood Education, 43 (November 1966): 9-11. (8, 28)

Carrington, Andrew T.; And Others, Class Size Project, 1980-1981. Final Report., Virginia Beach City Public Schools, Virginia, August 1981, 59 pp. (8, 26, 27)

Cotton, K. and W. G. Savard, Class Size. Research on School Effectiveness Project: Topic Summary Report., Alaska State Department of Education, Juneau. Office of Planning and Research, Juneau, Alaska, December 1980, 87 pp. (1)

DeAngelis, Joseph, Jr., The Influence of Class Size on Student Performance in a Secondary School Science Laboratory, Masters Degree Research Project at Beaver College, Glenside, Pennsylvania, 1977, 15 pp. (22, 26, 30)

Dejnozka, Edward L. and David E. Kapel. American Educators' Encyclopedia. Westport, CT: Greenwood Press, 1982, 634 pp. (5)

Eastburn, Lacey, "Report of Class Size Investigations in the Phoenix Union High School, 1933-34 to 1935-36," Journal of Educational Research, 31.2 (October 1937): 107-117. (17, 26, 30)

Filby, Nikola; And Others, What Happens in Smaller Classes? A Summary Report of a Field Study. Class Size and Instruction Project., National Institute of Education (DHEW), Washington, D. C., January 1980, 27 pp. (9, 29)

Flinker, Irving, "Optimum Class Size: What is the Magic Number?" Clearinghouse, 46 (April 1972): 471-73. (18, 26, 29-30)

Frymier, Jack R., "The Effect of Class Size Upon Reading Achievement in First Grade," The Reading Teacher, 18 (October-May 1964-65): 90-93. (9, 26, 27)

Furno, Orlando F. and George J. Collins, Class Size and Pupil Learning, Baltimore City Public Schools, Maryland, October 1967, 153 pp. (10, 26, 28)

Glass, Gene V. and Mary Lee Smith, Meta Analysis of Research on the Relationship of Class Size and Achievement. Class Size and Instruction Project., Far West Laboratory for Educational Research and Development, September, 1978. (10, 26, 28)

Good, Carter V. Dictionary of Education, 3rd Edition. NY: McGraw-Hill, 1973, 681 pp. (3, 4, 5, 6)

Good, Glen A., "Effect of Class Size on Skills Acquired in Typing," Dissertation Abstracts International, 1970, 31, 2790-A, Order No. 70-24,160. (22, 26, 30-31)

Johnson, Mauritz and Eldon Scriven, "Class Size and Achievement Gains in Seventh- and Eighth-Grade English and Mathematics," School Review, 75 (Autumn 1967): 300-310. (23, 26, 31)

Madden, J. Vincent, "An Experimental Study of Student Achievement in General Mathematics in Relation to Class Size," School Science and Mathematics, 68 (October 1968): 619-22. (19, 26, 30)

Menniti, Daniel J., "A Study of the Relationship Between Class Size and Pupil Achievement in the Catholic Elementary School," Dissertation Abstracts International, 1964, 25, 2854-55, Order No. 64-10,751. (19, 26, 30)

Meredith, Vana H.; And Others, South Carolina First Grade Pilot Project 1975-76: The Effects of Class Size on Reading and Mathematics Achievement, South Carolina State Department of Education, Columbia, January 1977, 96 pp. (11, 26)

Moody, William B.; And Others, The Effect of Class Size on the Learning of Mathematics: A Parametric Study., Paper presented at the meeting of the American Educational Research Association, April 1972, 13 pp. (12, 26)

Olson, Martin, "Ways to Achieve Quality in School Classrooms: Some Definitive Answers," Phi Delta Kappan, 53 (September 1971): 63-65. (4, 13, 26, 29)

Page, G. Terry, and J. B. Thomas. International Dictionary of Education. Cambridge, MA: MIT Press, 1980, 381 pp. (3, 5)

Philadelphia Federal Reserve Bank Study, "Schools Do Make a Difference," Today's Education, 64 (November-December 1975): 24-31. (13, 26, 29)

Project Primetime: 1982-83 Report., Indiana State Department of Public Instruction, Indianapolis Division of Curriculum, November 1983, 14 pp. (14, 26, 28)

Sava, Samuel G., "Prime Time in Indiana," Principal, 64.1, September 1984, p. 64. (32)

Shapson, Stan M., "An Experimental Study of the Effects of Class Size," American Educational Research Journal, 17.2 (Summer 1980): 141-52. (23, 26, 31)

Smith, Mary Lee and Gene V. Glass, Relationship of Class Size to Classroom Processes, Teacher Satisfaction and Pupil Affect: A Meta-Analysis. Class Size and Instruction Project., Far West Laboratory for Educational Research and Development, July 1979. (14, 29)

Spitzer, Herbert, "Class Size and Pupil Achievement in Elementary Schools," Elementary School Journal, 55 (October 1954): 82-86. (24, 26)

Stallings, Jane; And Others, Early Childhood Education Classroom Evaluation, California State Department of Education, Sacramento, California, January 1978, 114 pp. (15, 26, 27)

The Influence of Class Size on Academic Attainment and Student Satisfaction, Edward W. Clark High School, Las Vegas, Nevada, 80 pp. (24, 26, 31)

Warburton, John T., "An Experiment in Large Group Instruction," Journal of Secondary Education, 36 (November 1961): 430-32. (20, 26, 30)

Wilsberg, Mary and Lawrence Castiglione, The Reduction of Pupil-Teacher Ratios in Grades 1 and 2 and the Provision of Additional Materials: A Program to Strengthen Early Childhood Education in Poverty Area Schools., New York City Board of Education, Brooklyn, New York, November 1968, 244 pp. (16, 26)

Wolf, Frederic M. Meta-Analysis Quantitative Methods for Research Synthesis. Beverly Hills, CA: Sage Publications, 1986, 65 pp. (4)

Woodson, Marshall S., "Effect of Class Size as Measured by an Achievement Test Criterion," IAR Research Bulletin 8.2 (February 1968): 1-6. (25, 26)